Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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4274559155

BIOLOGY **0610/62**

Paper 6 Alternative to Practical **February/March 2022**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

[Turn over

1 A student investigated the effect of surface area on the rate of diffusion.

The student prepared different sized blocks of agar. The blocks of agar had different surface areas.

The agar contained universal indicator which made the agar green in colour.

The blocks of agar were put in hydrochloric acid. Universal indicator turns red in the presence of acid.

As the acid diffused into the agar block, the indicator changed from green to red in colour. The time taken for the acid to diffuse to the centre of the block was measured.

Step 1 $10\,cm^3$ of 1 mol per dm^3 hydrochloric acid was put into each of four test-tubes.

Step 2 The student used a ruler and a knife to measure and cut four blocks of agar, **A**, **B**, **C** and **D**, from a larger piece of agar. Each block was a different size, as shown in Fig. 1.1.

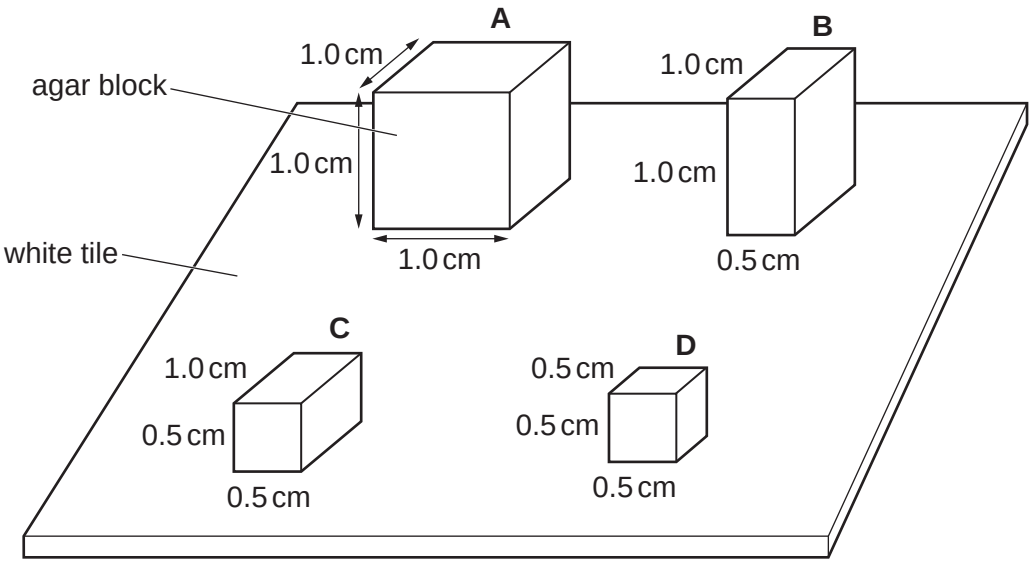


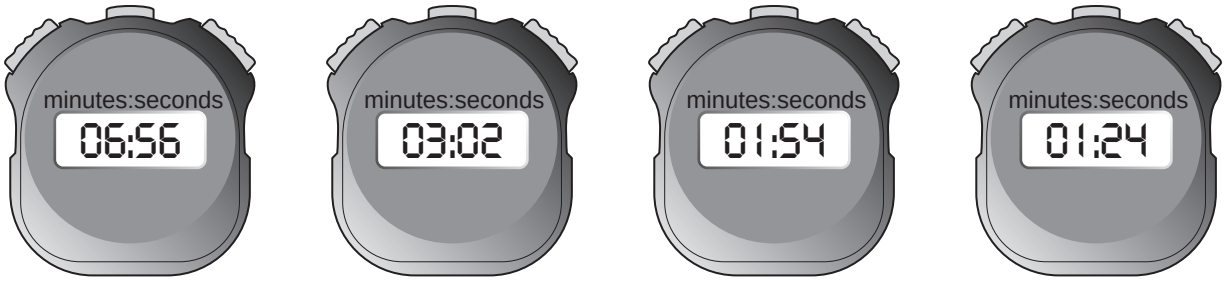
Fig. 1.1

Step 3 Agar block **A** was placed into one of the test-tubes containing hydrochloric acid. A stop-clock was started. The colour of agar block **A** was observed.

The time taken for agar block **A** to change in colour from green to completely red was recorded.

Step 4 Step 3 was repeated with the remaining blocks **B**, **C** and **D**.

Fig. 1.2 shows the time taken for each agar block to become completely red.



A **B** **C** **D**

Fig. 1.2

(a) **(i)** Prepare a table to record the results.

Convert the times shown in Fig. 1.2 to seconds and record them in your table.

[4]

(ii) State a conclusion for the results of this investigation.

.....

.....

..... [1]

(iii) State the variable that the student measured (dependent variable) in this investigation.

.....

..... [1]

[Turn over

(iv) State the variable that the student changed (independent variable) in this investigation.

.....

..... [1]

(v) State **two** variables that were kept constant in this investigation.

1 .....

.....

2 .....

.....
[2]

(vi) Suggest **one** way of improving the method used in this investigation.

.....

.....

..... [1]

(vii) Describe how step 2 could be carried out safely.

.....

.....

..... [1]

(b) Table 1.1 shows the surface areas and volumes of the blocks of agar that were used in the investigation.

Table 1.1

length of sides / cm	surface area / cm^2	volume / cm^3	surface area to volume ratio
1.0 × 1.0 × 1.0	6.00	1.000	6:1
1.0 × 1.0 × 0.5	4.00	0.500	8:1
1.0 × 0.5 × 0.5	2.50	0.250	
0.5 × 0.5 × 0.5	1.50	0.125	12:1

Calculate the surface area to volume ratio for the 1.0 cm × 0.5 cm × 0.5 cm block of agar.

..... [1]

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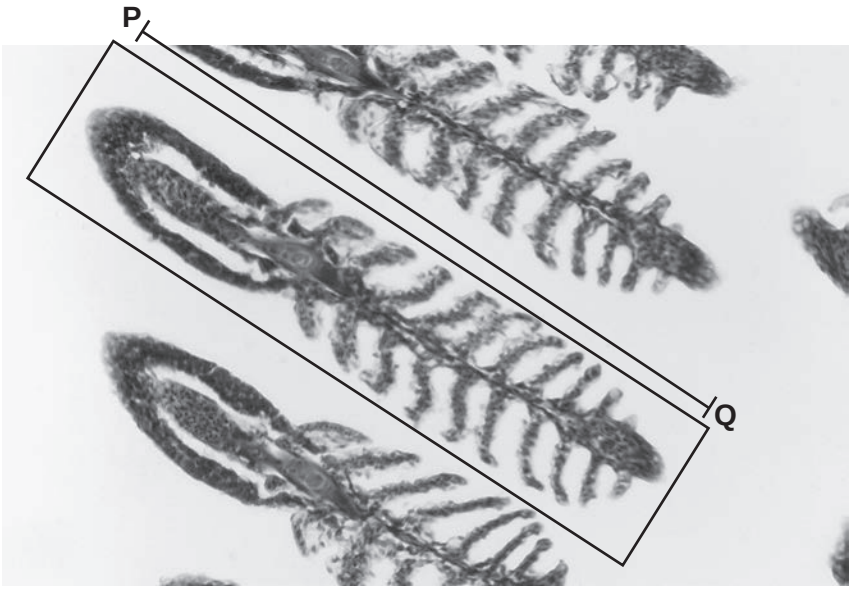
(c) (i) Many organisms have adaptations that increase the area of their gas exchange surfaces.

Fig. 1.3 is a photomicrograph of part of a fish gill.



magnification ×550

Fig. 1.3

Draw a large diagram of the part of the fish gill shown in the box in Fig. 1.3.

[4]

(ii) Measure the length of line **PQ** in Fig. 1.3.

length of line **PQ** ..... mm

Calculate the actual length of the part of the fish gill using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line PQ}}{\text{actual length of the part of the fish gill}}$$

Give your answer to **three** decimal places.

Space for working.

..... mm
[3]

(d) Fish is a source of protein in the diet.

State how you could test a sample of food to show that it contains protein.

Include the result of a positive test.

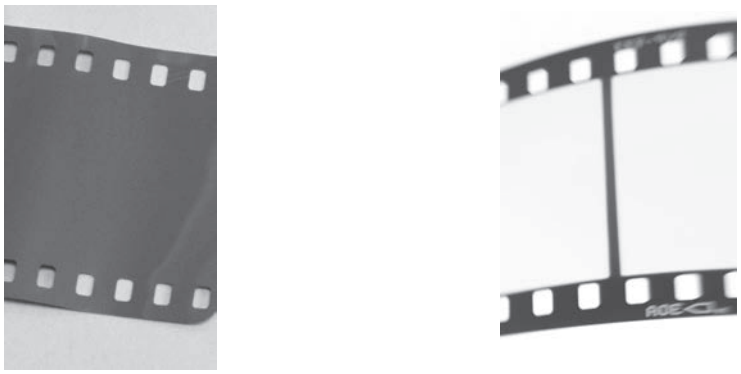
.....

.....

.....

..... [2]

(e) Photographic film consists of a plastic sheet coated in crystals. The crystals are fixed to the plastic sheet by gelatin, which is made of protein. If the gelatin is digested by protease enzymes the crystals fall off and the film will become transparent, as shown in Fig. 1.4.



before protease treatment after protease treatment

Fig. 1.4

Plan an investigation to determine the effect of temperature on the activity of a protease enzyme, using photographic film.

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..... [6]

[Total: 27]

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2 Cabbage leaves contain vitamin C. Boiling the cabbage in water reduces the vitamin C content of the leaves. Some students investigated the effect of boiling time on the concentration of vitamin C remaining in the cabbage leaves.

(a) The students prepared the cabbage samples using this method:

Step 1 Heat a large volume of water until it begins to boil.

Step 2 Measure the mass of chopped cabbage leaves.

Step 3 Place the chopped cabbage leaves into the boiling water.

Step 4 Continue to boil the water.

Step 5 Remove a sample of cabbage leaves from the water at each time interval.

State **two** pieces of apparatus, other than safety equipment, that would be required to carry out the method described in steps **1 and 2**.

1 .....

2 .....
[2]

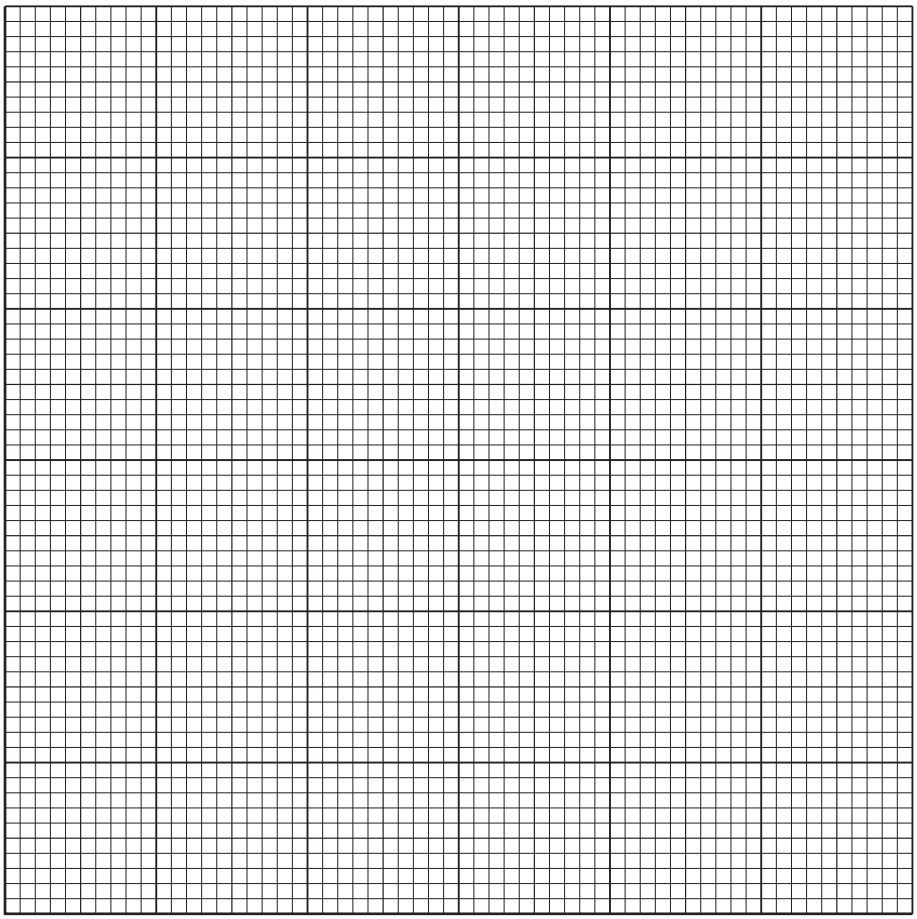
(b) The vitamin C concentration of each cabbage leaf sample was then determined.

The results of the investigation are shown in Table 2.1.

Table 2.1

boiling time / minutes	vitamin C concentration / mg per 100 g of cabbage leaves
0	34
5	31
10	26
15	22
25	13

(i) Plot a line graph on the grid of the data in Table 2.1.



[4]

(ii) Use your graph to estimate the concentration of vitamin C in a sample of cabbage leaves that has been boiled for 20 minutes.

Show on your graph how you obtained your estimate.

..... mg per 100 g
[2]

(iii) Table 2.1 shows that at the start of the investigation 100 g of unboiled cabbage leaves contained 34 mg of vitamin C.

Using the information in Table 2.1, calculate the percentage decrease in the vitamin C content of 100 g of cabbage leaves after boiling for 25 minutes.

Give your answer to **two** significant figures.

Space for working.

..... %
[3]

(c) The students wanted to know if the vitamin C had moved from the cabbage leaves into the water that the leaves were boiled in.

State how the students could test the water for the presence of vitamin C.

Include the result of a positive test.

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..... [2]

[Total: 13]